

REMARKS

Examiner is thanked for the Official Action of June 20, 2003. This request for reconsideration is intended to be fully responsive thereto.

DUPLICATE CLAIMS

Claim 31 was objected to under 37 CFR 1.75 as being a substantial duplicate of Claim 1. Claim 32 was similarly objected as being a substantial duplicate of Claim 2. Furthermore, Claim 35 was similarly objected as being a substantial duplicate of Claim 5. Applicant followed the examiner's suggestion and canceled Claims 31, 32, and 35. Therefore, by this amendment, claim objections under this section of CFR are moot.

REJECTION UNDER 35 U.S.C. 112

Claims 6 and 32 were rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 6 was rejected on the ground that Claim 6 depended from canceled Claim 3. By these amendments, Applicant amended Claim 6 to depend from Claim 1. Applicant added new Claims 54 and 55 with same limitation as Claim 6 to be dependent from Claims 4 and 5 respectively. No new matter has been added.

Claim 32 was rejected. However, Claim 32 was canceled as already announced above. Therefore, Examiner is respectfully solicited to withdraw the rejection under 35 U.S.C. 112.

REJECTIONS UNDER 35 U.S.C. 102(b) REGARDING CLAIMS 1, 4-6, 31, 34,

35

Claims 1, 4-6, 31, 34 and 35 were rejected under 35 U.S.C. 102(b) as being clearly anticipated by US 4804592 to Vanderborgh et al. Examiner requested to review abstract, figs. 2, 3, col. 3, line 37 to col. 4, line 36, col. 5, lines 1-44, col. 6, line 33 to line 60, col. 8, lines 13-61 and especially Table 1 of Vanderborgh et al.

Vanderborgh et al. discloses a porous composite electrode for use in electrochemical cells, which has a first face and a second face defining a relatively thin section therebetween. The electrode is comprised of an ion conducting material, an electron conducting material and an electrocatalyst. The volume concentration of the ion conducting material is greatest at the first face and is decreased across the section while the volume concentration of the electron conducting material is greatest at the second face and decreases across the section of the electrode. Substantially all of the electrocatalyst is positioned within the electrode section in a relatively narrow zone where the rate of electron transport of the electrode is approximately equal to the rate of ion transport of the electrode.

The present invention discloses a multi-layer electrode structure comprising electrode layers of a binder and an electrode material which are coated on a current collecting material. A first electrode layer contacts the current collecting material and a second electrode layer contacts the first electrode layer. They are formed of different constituents or have different proportions of the same constituent, and said first electrode layer has a stronger adhesive strength than said second electrode layer relative to said current-collecting material. Applicant amended Claim 1 to reflect the elements of the specification in that the first electrode layer is thinner than the second electrode layer. This amendment is supported by the original specification and is shown in Table 1 and between the last paragraph of page 18 and the first paragraph of page 19. An object of this structure is to create better electrochemical effect, that is, to have effective adhesive properties, having low resistance (or impedance) of the

electrode. No indication of the thickness of the layers and the stronger adhesive strength of said first electrode layer relative to said current-collecting material than that of said second electrode layer was disclosed or suggested in Vanderborgh et al.

REJECTIONS UNDER 35 U.S.C. 102(b) REGARDING CLAIMS 1, 2, 6, 31-32

Claims 1, 2, 6, 31 and 32 were rejected under 35 U.S.C. 102(b) as being anticipated by JPO machine translation for JP11-167214 to Osawa et al. Examiner stated that the multi-layered positive electrode structure comprises a first layer 3 and a second layer 4 where the first layer is coated on the current collector. "The first layer is low resistance and the second layer is high resistance during overdischarge such that the first electrode layer has a higher electrical conduction rate than (than) the second electrode layer since it has a lower resistance. The active material used for the first electrode layer and that of the second electrode layer is different." For example, the first layer is 5 weight section of polyvinylidene fluoride as a binder and 3 weight section artificial graphite and active material while the second layer is 5 weight section of polyaniline as binder and 95 weight section of active material. The use of polyvinylidene fluoride improves the adhesion of the first electrode layer to the current collector.

Again, no indication or suggestion was made as to the thickness of the electrode layers.

Applicant recognized that paragraph 7 of the machine translation states that conductive polymer such as polypyrrole or polyaniline is used for the binder for the second layer and fluorine-contained resin or cross-linking polymer such as polyvinylidene is used for the binder for the first layer, and the use of polyvinylidene fluoride improves the adhesion of the first electrode layer to the current collector. Surely, polyvinylidene fluoride has stronger adhesive strength than the conductive polymer which adhesive strength is very poor. However, polyvinylidene fluoride is, in itself, known to be a less-adhesive material. To the contrary, the present application explained that the binder polymer, which easily forms fibrils, do not effectively bind with

the current-collecting material and therefore such binder polymer is used in the layers other than the first electrode layer.


Furthermore, the fourth Sample of the present invention uses polyvinylidene fluoride as the binder for the second electrode layer and explains that polyvinylidene fluoride is a polymer that forms easily into fibrils (last paragraph, page 19 of the present invention). Therefore, it is somewhat difficult to understand that polyvinylidene fluoride was used as the binder to create higher adhesive strength in Osawa et al.

CONCLUSION

Neither Vanderdorgh et al. nor Osawa discloses or suggests the technology relating to the thickness of the layers and adhesive strength of the layers to the current-collecting material in relation to the improved electrochemical effect.

It is respectfully submitted that claims 1, 2, 4, 5, 6, 34 and 54 are now in condition for allowance and notice to that effect is respectfully requested. No new matter has been added.

Should the examiner believe further discussion regarding the above claim language would expedite prosecution they are invited to contact the undersigned at the number listed below.


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